INDUSTRY WEEK
PENTON/IPC
THE BUSINESS MANAGEMENT MAGAZINE

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THE RACE FOR THE DESKTOP

SPECIAL ADVERTISING SECTION - NOV. 12, 1984

Rhapsody in blue.

In today's office automation environment, Wang realizes that simply making better products is no longer enough.

Because in today's office automation environment, the products of one company must often work in harmony with the products of another.

And that's why Wang's entire line of computers are not only compatible with each other, but work just as easily with most IBM products.

Wang. Maybe we're more competitive simply because we're more compatible.

WANG

We put people in front of computers.

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THE RACE FOR THE DESKTOP

PREPARED FOR INDUSTRY WEEK BY INTERNATIONAL DATA CORPORATION

In little more than 25 years, computers have evolved from the cabalistic to the cliched—what used to be the incomprehensible jargon of hackers and weirdos has become the everyday talk of schoolchildren and television heroes.

And nobody escapes. Computers are transforming behavior as well as language. In business, they are replacing calculators and

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typewriters and filing cabinets and sometimes even people.

Keyboard and all, they now signal status in the executive suite—a computer says its keeper boasts access to information, and control of it.

But there's more than just appearances at stake here. Computers are fast becoming instruments of survival. Without them, managers and professionals are doomed to the backwaters of too-little-information-too-late.

For it is *information* that is the lifeblood of business—any business—and of those who must make and execute critical business decisions.

This fourth White Paper to Management, prepared for INDUSTRY WEEK by International Data Corporation, tracks how computers and the networks that link them are now moving into the hands of the nation's managers and professionals—promising thereby a major transformation of the ways American business conducts its business.

INFORMATION PRODUCTIVITY

Success and failure depend on how information is gathered, presented, and used. If your information is incomplete and comes to you slowly, if you have no means to manipulate it and explore its implications, you lose—you have become a victim of unproductive effort.

This is not a new idea: productivity has been an American watchword for generations.

It's at the center of union/management negotiations. It stands behind our pride that we're the world's breadbasket even as farmers constitute less than 3% of our workforce. We measure it, we argue about it, we build factories around its principles.

Yet only lately have we taken up the gauntlet of white collar productivity. Well we should: white collar workers now constitute a majority of America's workers and no less than 70% of the nation's payroll; managers and professionals alone make up over a quarter of the country's labor force, while the number of clerical workers pushes toward 20%.

White collar workers are no less productive than they used to be—it's just that there are so many more of them than there used to be. And the chief tools with which they leverage their efforts, typewriters and telephones, haven't changed much since 1900—when white collar workers constituted less than a fifth of the workforce and farmers accounted for 35%.

IDC extrapolations of government and computer installation statistics show that industries with more computing power per worker tend to have higher profits per worker. But specific measures of how workers are more productive—and how much—are tough to come by. We have only hints to back up our intuition.

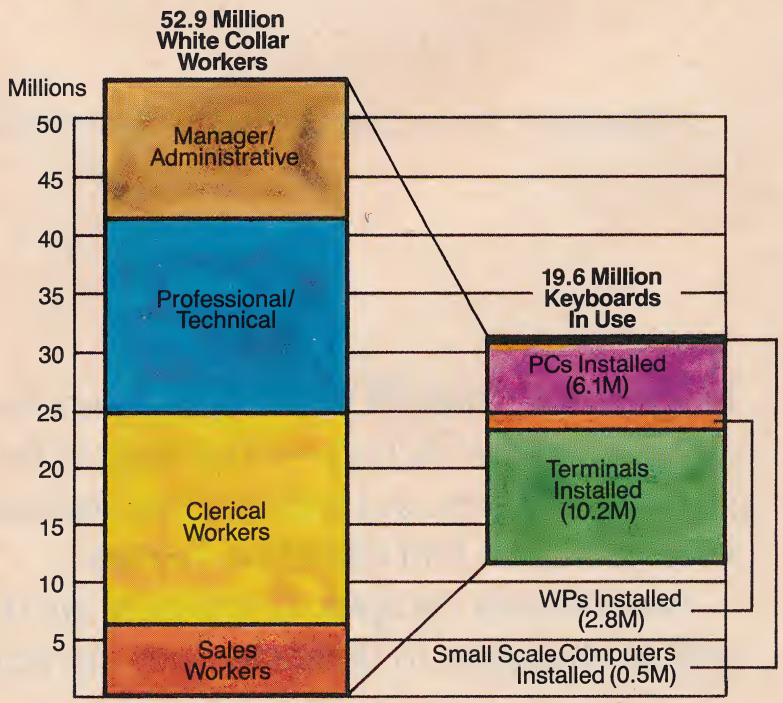
Results of a pilot study of an electronic mail system at Digital Equipment Corp. using the company's ALL-IN-1 system (which included word processing, calendar management, and personal computing) are worth noting for the effect on paper alone—50% of paper memos were eliminated, interoffice mail was cut 94%, copying was shrunk some 60%—and time on the telephone dropped a stunning 80%.

COMPUTERS MAKE USERS OF THE WHITE COLLAR WORKFORCE

(U.S. White Collar Workforce in Millions; Equipment Installed In U.S. As Of Yearend 1984)

With almost 20 million computer-based keyboards at the hands of the nation's white collar workers, there's a productivity revolution underway. Computers or devices that access them have penetrated 37% of the white collar workforce—that's better than one keyboard for every three white collars. And if sales workers are excluded (their computers are often specialized and not counted here), then 42% of managers, professionals, and clerical workers are using computers.

While most of those devices are handling tasks rarely performed by managers and professionals—like data entry or word processing—the revolution has not stopped at the executive suite. The personal computer is finding its way to managers' and professionals' desks; by the end of this year, there'll be a PC for every five managers/professionals in the United States.



Sources: International Data Corporation, U.S. Bureau of Labor Statistics

Cullinet's Manufacturing System works wonders for your coordination.

These days, manufacturing even the simplest product is a big production. Unless every detail is carefully coordinated, productivity suffers. And even when everything is running smoothly, a change in consumer tastes or corporate direction can throw a monkeywrench into the works.

The Cullinet Manufacturing System—a net-change, closed loop MRP II system—gives manufacturing personnel a new and better way to plan, control and react to real world changes.

The system consists of eight applications modules: bill of materials, material requirements planning, inventory control, shop floor control, master production scheduling, purchasing, cost control and order entry. While each module offers standalone superiority, it's the aggregate strength of the system that sets it apart.

You see, each module is integrated with every other module. What's more, the System also integrates with our IDMS/R database management system and other Cullinet applications like our financial package. The net result: better coordination throughout the manufacturing environment, and throughout the corporation.

To learn more about our Manufacturing System and our complete approach to information management, attend a Cullinet Seminar. Make arrangements by sending in this coupon, or by calling, toll-free, 1-800-225-9930. In MA, 617-329-7700.

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Decision Support Applications Database

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A similar TRW, Inc., study of professionals who were heavy users of DEC's ALL-IN-1 system indicated it saved each worker about an hour a day.

This is piddling evidence. Our urge to automate white collar workers—first the clerical functions and now the activities of professionals and managers—is based more on what we firmly believe better tools can do for the ones who use them (read: Yankee ingenuity) than on hard facts about direct labor savings.

BEYOND ISLANDS OF AUTOMATION

"In the world market, the company that can take a product from concept to manufacture most rapidly and produce most efficiently will have substantial advantage in becoming a market leader," notes AT&T Information Systems' Dennis Oliver. "But current methods impede productivity solutions—each piece of the pipeline from concept to production is handled as a module, separate from other modules and most often using a printed report as an interface tool."

Modules abound. Small business computers have brought the rudiments of automation to medium-sized firms and corporate departments. Word processors have been automating secretarial tasks for several years. Terminals have been accessing data in number-crunching mainframes for longer than that. Even older are private branch exchanges (PBXs) that switch telephone traffic in a company.

Forces of Change

Each of these modules—"islands of automation," some call them—has undergone substantial change in the last few years, pushed by a couple of primal forces:

- Personal computers are transforming professional and management work habits by individualizing the power of the computer. PCs have churned up interest in multifunction systems, where data processing and office automation functions are combined in a single system with new kinds of software.
- New communications capabilities, such as micro-to-mainframe software links and local area networks, are responding to the flood of computers and information. Vendors are looking for ways to combine transmission of voice, data, and even video signals on a single network.

Common to all these trends and developments is the urge to link together those islands of automation. Every major vendor and most minor ones are working on new products and/or striking deals with other companies so that their product lines constitute complete offerings of what's once again being called "distributed processing."

With such systems it's a short step to integrate the work of professionals and managers with activities on the factory floor, too.

Too Much Abundance?

But there's a cornucopia of alternative approaches to this inevitable and very necessary integration of systems. At the heart of such abundance is vendors' resistance to any single industry-wide automation standard—or even a standard for part of the automation task, such as local area networks or micro operating systems.

This springs from the nature of competition itself and it bears several kinds of fruit—several kinds of vendors offering several kinds of distributed processing alternatives:

- IBM has dominated the data processing world and will offer its own approach to integrated automation, probably based in its skills as a hardware systems manufacturer.
- AT&T has similarly dominated the telephony side and, now liberated from the constraints of government regulation, will also offer its own sort of integration, likely anchored in what it knows best—communications.
- Niche-oriented vendors—like Wang and DEC—that have built a large list of customers in broad-based horizontal markets are

TAKING A COURSE FROM PROF. 350

Technical staff are valuable precisely to the degree that their technical knowledge is up-to-date. But that can be a gargantuan task if you're a major computer manufacturer with thousands of field service technicians all over the world.

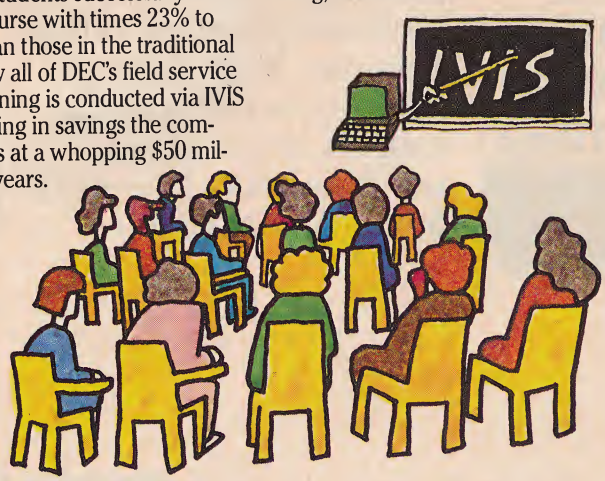
Digital Equipment Corp. found itself overwhelmed with its technical training problem: travel costs alone accounted for over half its training budget, and the far-flung company had trouble standardizing and streamlining its training operations.

Three years ago, DEC undertook a high-tech solution—it developed what's now called the Interactive Video Information System (IVIS), which combines the firm's Professional 350 personal computer with high-resolution video, dual-channel audio, a touch-screen, and bit-mapped graphics and text.

IVIS was used as a teacher. An interactive IVIS pilot course on the repair and maintenance of a printer was tried out—and compared to a non-interactive audio-visual lecture/lab course on the same subject that was twice as long.

DEC's IVIS students successfully completed their course with times 23% to 46% better than those in the traditional course. So now all of DEC's field service technician training is conducted via IVIS courses, resulting in savings the company estimates at a whopping $50 million over five years.

Indeed, IVIS is such a powerful product that DEC has taken it to market, where it's been used in such diverse fields as banking, real estate, management training, and medicine.



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strong enough to develop their own approaches to integrated automation.

• Yet another group of vendors constructs state-of-the-art products which, while more functionally advanced and capable than the offerings from IBM, AT&T, and the niche suppliers, subscribe to different technologies and standards (such as Hewlett-Packard and Apple in personal computers, Apollo in 32-bit workstations).

DECISIONS, DECISIONS

So corporate decision-makers must contend with multiple de facto technological standards which represent multiple solutions to the problems of linking islands of automation.

It's tough not to be overwhelmed by what seems like a dubious wealth of options—hundreds of hardware vendors, thousands of software vendors, a communications market just beginning to spill over with new suppliers and technologies. And it will get tougher.

Nor is it obvious who should captain the ship: DP/MIS, which is accomplished at systems implementation? Administrative services, which understands automation's impact on office functions, or that committee assigned to develop office automation strategy? Or communications, which grasps a company's traffic patterns and is being beefed up anyway to cope with the divestiture?

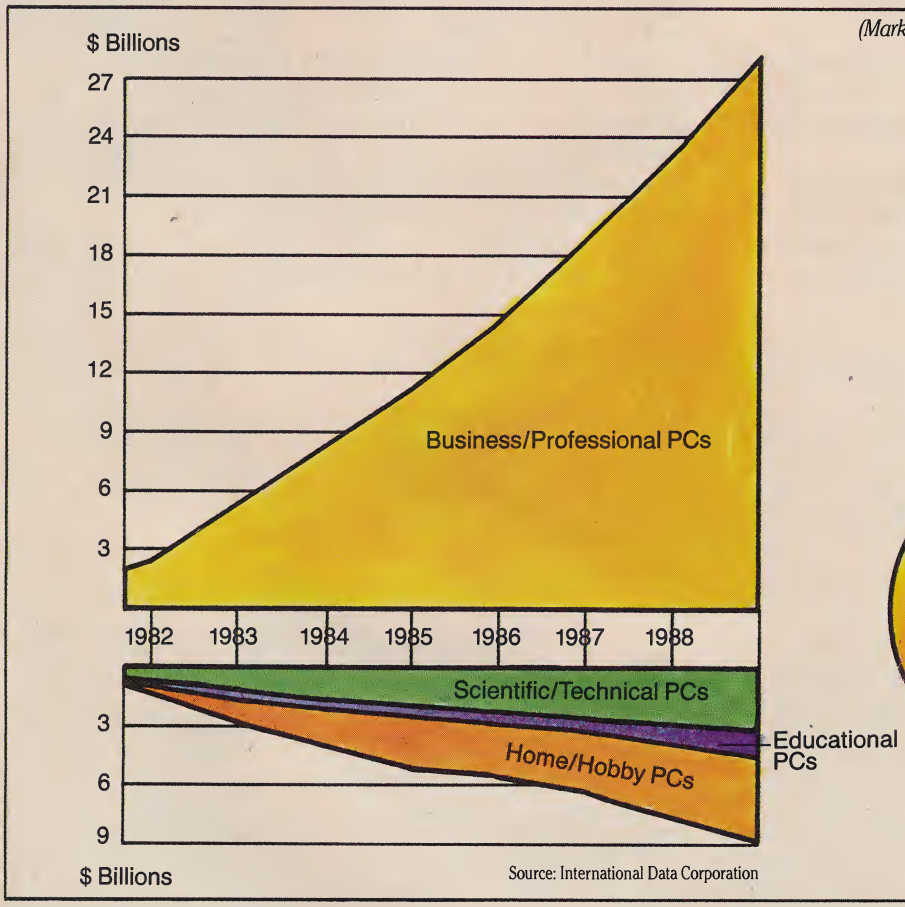
Meanwhile, the base of computer keyboards is expanding at over 30% per year: on average, eight million new keyboards will be installed in U.S. businesses each year for the next five years.

A decade ago, 95% of spending for information processing equipment (with the exception of telephones and copiers) was under central MIS control; today, it's less than 65%. Computers have become so inexpensive that they are easily purchased (sometimes surreptitiously) under department budgets that are beyond MIS control—but the system in Department A is often incompatible with the one in Department B.

Those who do not automate must inevitably slip into a competitive doldrum. But which way to go? Everyone cannot choose the same path; each organization must determine its present and future needs and build its automated systems according to the strategy that most effectively meets those needs.

SOUNDING THE PC TRUMPET

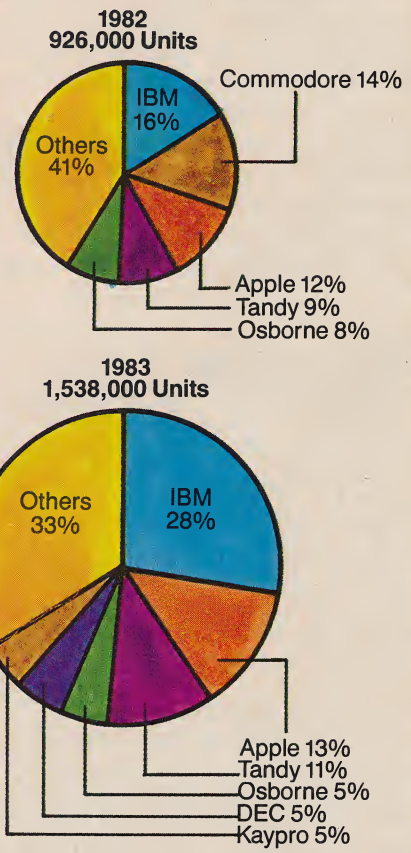
(Value of U.S. Shipments By U.S. Manufacturers)



Source: International Data Corporation

. . . AND LOOK WHO'S GRABBING THE LION'S SHARE OF U.S. BUSINESS PERSONAL COMPUTERS

(Market Share Of U.S. Business PC Shipments)



By 1989, there will be over 50 million personal computers operating in U.S. businesses, and corporations of all sizes and types will be spending billions for them as these machines become increasingly powerful and sophisticated even as their pricetags shrink a bit.

Meanwhile, the rigors of competition will weed out weaker vendors and the PC marketplace will become more stable. The trend is quite evident already—of 1982's top five competitors, one disappeared from the market by 1983 and another lost share, while the other three strengthened their positions.

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PERSONAL COMPUTERS MEAN NEW KINDS OF USERS

Since 1981, when IBM entered its PC in the personal computer race and threw open the door to the business market, micros have spawned like rabbits in Australia. This year, over two million PCs will be shipped to American businesses; by 1989, that number will increase to almost nine million.

The effects of the PC are so widespread that it's taken several years for the implications to sink in.

Personal computers are in the hands of a new kind of user. Initially, PCs handled lone jobs for lone individuals, a kind of isolated but critical leveraging that was very exciting for PC users because PCs did things that terminals and word processors and small scale computers couldn't do—either because they were geared for other sorts of jobs or were just too big and complicated to bother with.

Now there are so many PCs that:

- They are fast becoming normal tools of business management and companies must find ways to leverage *again*, so that work done by one person on one PC doesn't have to be replicated on another and another and another.
- PCs have posed a major threat to other kinds of computing styles, most notably word processors and timesharing services, so that vendors of these older styles have been forced to respond.

The result is a new kind of environment for managers and professionals as well as computer industry players.

IBM's Role

Big Blue's PC is the hands-down de facto industry standard. By the end of 1984, personal computers shipped with MS DOS—the 16-bit-oriented IBM PC operating system—will account for 60% of all business PC shipments. And IBM itself claims 40% of all business PCs shipped in 1983.

How to survive, if you're a hardware vendor, in this IBM-dominated world is not obvious. Many have tried various levels of compatibility, which guarantees little.

Others have staked out non-IBM territory, most notably machines that run the 16-bit/32-bit UNIX operating system. AT&T, new to the competitive arena, has tried to launch both an IBM-compatible system and a UNIX system.

Still others have developed state-of-the-art systems that are a step ahead of IBM and its imitators—Apple's Lisa and Macintosh products are notable examples—but they struggle to find acceptance in a business community enamored of IBM's clout and stability.

Open Architecture

Since its debut in the personal computer market, IBM has offered a clear view of its system architecture to software developers, and by default to competitors as well. It's a policy that runs directly counter to old IBM tradition, and many wonder if Big Blue's open architecture will close up once more.

IBM's rationale for its openness has to do with software. Since software development is labor-intensive and therefore costly, hardware manufacturers—even well-heeled ones—cannot afford to develop the vast number of software packages needed to feed a mass-oriented PC market.

And since software developers want to focus their limited resources where they'll make the most money—on applications packages written for operating systems which run on the most machines—IBM knew an open architecture policy would boost the amount of software available that's compatible with its PC, which would in turn result in greater hardware sales.

Delivery Channels

A bit of calm has settled over PC distribution channels after several years of upheaval.

The retail channel has found some stability, and has even

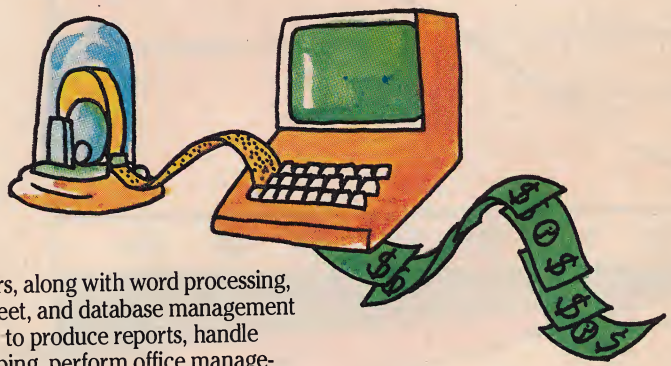
SMART PLANNING BY MICRO

A financial planner whose clients are middle income—$25,000 to $75,000—has to find a way to offer a valuable service for a reasonable price that such clients can afford.

Automation is key to the speed and efficiency that such a business requires, believes Jerry Ball, president of Diablo Valley Financial Services (Walnut Creek, CA). He started automating his operations in 1975 with a cassette tape word processor.

Today, though, Ball's company uses much more sophisticated equipment to generate the financial reports that are the core of Diablo Valley's business. "We used to spend hours with the calculator and adding machine," he recalls, "to redo the numbers. Then the report had to be completely retyped."

No longer. Diablo Valley uses Altos Computer Systems' 8000 series micro-



computers, along with word processing, spreadsheet, and database management software, to produce reports, handle bookkeeping, perform office management and calendaring tasks, and track accounts. Ball has even developed cash flow models for a few clients.

Each of Ball's three Altos 8000s supports three terminals—altogether, ten employees access the systems.

And thanks to a 300-baud Smartmodem from Hayes Microcomputer on each micro, Diablo Valley can maintain a "stock watch" via subscriptions to two on-line stock market databases. The firm also leases an estate planning program which is updated via micro communications.

Diablo Valley has come a long way since its cassette tape word processor. "A computer," says Jerry Ball, "is an absolute must in this business."

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started to segment vertically in search of new customers as the first flush of buyers fades.

Computer store chains claim a large percentage of PC sales—Computerland operates over 500 stores worldwide, emphasizing product comparison and customer support. But strongest retail growth these days goes to chains like Businessland that aim at corporate accounts, discounting, private-label software, and big ticket sales. Little wonder, since mass merchandisers have begun to sell low-end and home systems at very discounted prices.

Manufacturers, meanwhile, have rediscovered the direct sell; many have established national accounts for large corporations that buy PCs in bulk.

For PC buyers, the acquisition channel is no trivial matter. Retail chains can offer local support and quantity discounts on equipment from multiple vendors. Manufacturers can offer deeper discounts, specialized support, and sometimes financing alternatives.

PC Software

Personal computers have a tremendous appetite for software of all types. So strong is the demand for PC software that IDC expects supplier revenues to grow nearly 50% per year through the rest of the 1980s.

PC software falls into three basic categories:

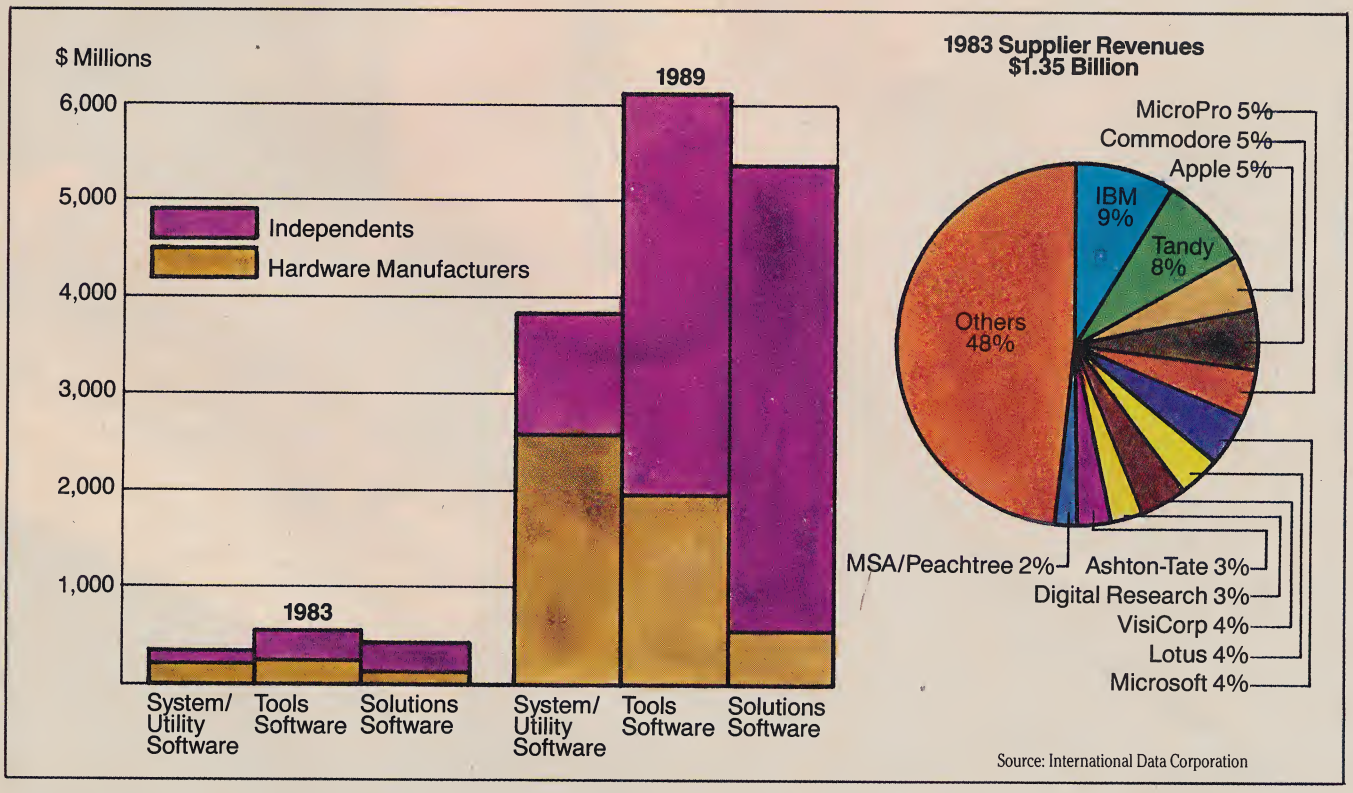
- *System/utility software* includes operating systems, communications software, and other programs that operate the hardware and ensure program integrity.
- *Application tools software* includes programs that allow users to retrieve, organize, manage, and manipulate data and databases—examples are database management systems, spreadsheets.
- *Application solutions software* includes transaction processing programs that provide solutions to specific business problems which are usually limited to a given industry or function—examples are accounting, banking, and manufacturing software packages.

The PC software market is populated with, literally, thousands of suppliers, the largest of whom tend to offer mostly system/utility and tools packages, since these are required by virtually all PC users. Most suppliers are very small, and their ability to survive is not at all assured.

Recently, though, mainframe software suppliers like Cullinet have begun moving into the PC arena with integrated offerings. Cullinet's Goldengate, for instance, combines PC communications, spreadsheet, graphics, and database management.

A FRACTIOUS PC SOFTWARE MARKET LUNGES FORWARD

(Worldwide Revenues of U.S. Suppliers)



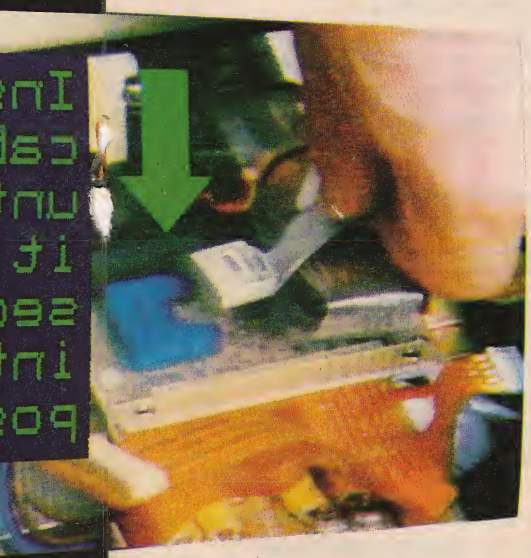
Source: International Data Corporation

The thunderous arrival of personal computers has spawned a wild market for PC software where no single supplier dominates and thousands vie for a piece of the action. Though the major PC hardware manufacturers play important roles here, they tend to focus mostly on system/utility software (like operating systems) and somewhat on tools software (like database management systems or spreadsheets).

That leaves lots of room for the small independent software companies to compete not only in the software tools sector, but also in the many vertical niches that comprise the solutions software sector.

The bottom line for users is the promise of an abundance of off-the-shelf software for PCs from a wide variety of competitors.

Insert
cable
until
it snaps
securely
into
position



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Digital developed the IVIS system for decentralized training of our own people. (At this point we project a 40% savings in training field service personnel because we're using IVIS.) We not only have more experience with interactive video than anybody else, we are willing to make that experience available to you. First, we are developing a library of IVIS programs. Or we can use our writing, filming, editing, and programming capabilities to fully produce an IVIS program specifically for you. What's more, our unique authoring system, the VAX Producer, allows you to develop your own programs.

To find out more about IVIS, simply call 1-800-DIGITAL and ask for extension 595.

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WORD PROCESSING STANDS GUARD

The word processing market has been the stalwart of office automation right into the 1980s.

In 1984, almost 700,000 word processing keyboards, worth $2.3 billion, will be shipped in the U.S. by domestic manufacturers. By the end of 1988, over eight million word processors will be in use in U.S. businesses.

But these machines mostly have helped boost clerical—not managerial—productivity. Comparatively few executives and professionals regularly use dedicated word processing devices; those who do tend to be in writing-intensive jobs—technical editing, consulting, marketing support.

The PC Threatens

Most WP manufacturers were caught by surprise when the personal computer began bringing the productivity improvements inherent in office automation to the desks of most corporate managers and white collar professionals. The traditional superiority of dedicated WP software is being challenged by new PC word processing software products. It's no accident that the number one application on personal computers is word processing.

So WP vendors are fighting back—and they have some advantages in the battle.

Their sales and support staff is already geared to unsophisticated users. They're taking advantage of developments in data communications, especially local area networks, by providing links to mainframe computer systems. Some are establishing migration paths from standalone systems to clustered systems, either through local area networks, or by making standalone WP terminals part of a hierarchical office automation system.

Many WP vendors have added personal computing features to their word processors. Some, like Wang, have debuted PC products of their own. And WP products are being spruced up with enhanced peripherals such as color graphics and ink jet printers.

Multifunction Systems

Vendors of word processors and personal computers each have their corners of the business market. The old-line data processing system vendors are still trying to claim theirs by means of multifunction systems.

For a data processing system to be multifunctional requires software—some $567 million worth of multifunction system software will be shipped in 1984. By 1988, multifunction system software shipments will pass $4 billion.

Eventually, multifunction systems will also trigger substantial hardware sales, particularly in peripherals, workstations, and system upgrades.

Multifunction systems must be compatible to and upgradable with vendors' existing product line and able to run widely available software that's often not compatible with older product lines. Some of these systems even come with two microprocessors in them—one for each compatibility.

That's why it's so difficult to define today's multifunction systems—they're software joined with the principle of distributed processing. Examples are Computer Console's Office Power, Data General's CEO, Digital Equipment Corp.'s ALL-IN-1, Hewlett-Packard's Interactive Office, Honeywell's DPS-6, IBM's DISOSS, Philips Information Systems' Office Automation Network, Sperry's Sperrylink.

Certainly, word processing is a component, but can multifunction systems perform many jobs, like electronic mail, spreadsheet analysis, calendaring?

OVERCOMING THE BABEL OF BIRD-MAKING

Making satellites is a complicated proposition—especially since customers want a customized product. Lots of design changes and some tug-of-war between assorted engineering and manufacturing departments is typical. The result often is a slow, expensive birth of a bird.

Hughes Aircraft Co.'s Space and Communications Group decided to try a streamlining of the process. "The core mission for our management systems organization," explains George Emmanuel, the group's manager of product development and support, "was to develop information systems that cut across divisional boundaries and rely on a large base of common data."

That meant getting three different engineering labs—communications, space vehicles, and control data systems—to use one system and one database.

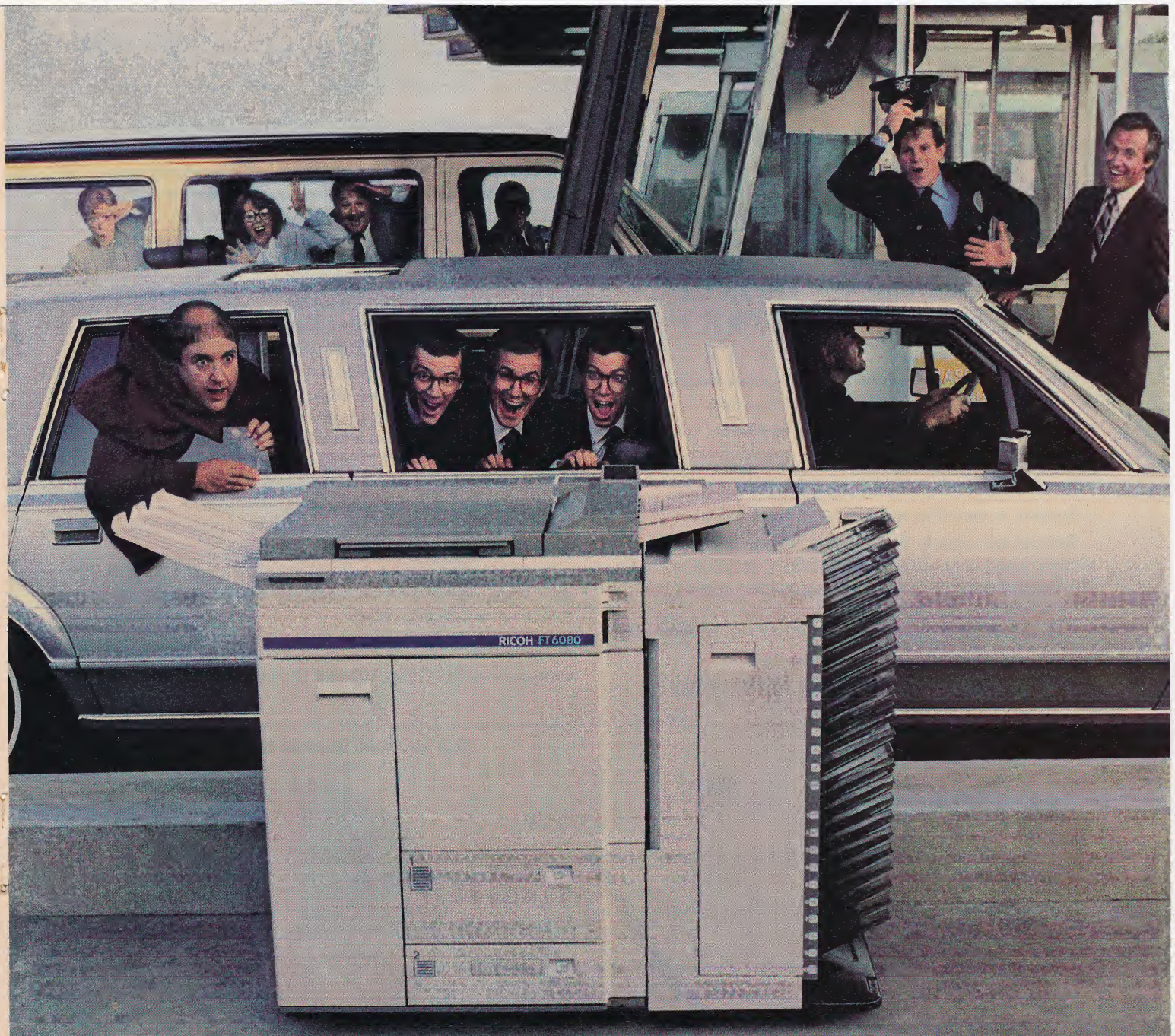
"Each one," says Emmanuel, "naturally tends to think its needs are unique, requiring a dedicated system. But what we found was that each lab had essentially the same problem; they differed only in their perspectives and in the words they used to describe it."

The group turned to Cullinet Software, Inc.'s Manufacturing System linked with Cullinet's Integrated Database Management System so that the manufacturing modules would run off a common database.

By developing two major engineering modules—a summary parts list and a drawing parts list—the group's management systems staff created one system with one database that met the needs of all the labs.

"The network architecture," notes Emmanuel, "enabled us to write a single, generic application providing each lab with its own distinctive view." So much for the Tower of Babel.

Hughes also got an integrated manufacturing system which it's now refining to more accurately reflect engineering changes and materials traceability.



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Even though it's new, the Ricoh 6080 is already number one in its class. It's the first mid-sized copier with so many features. In fact, it's got some features you normally find only on much larger, more expensive copiers. For example, it has a unique feature that lets you automatically combine two different images on a single copy. Plus automatic two-sided copying. And automatic reduction and enlargement.

But there's one thing about the new Ricoh 6080 that's not unique. It's made to the same high-quality standards all Ricoh copiers are.

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We're a copier maker that's too big to overlook.
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Tomorrow's multifunction systems, which will be heavily oriented to communications, can be expected to include:

- The same command formats for calling up assorted functions.
- Transmission of text, numbers, images, voice over one system.
- Secure realtime and store-and-forward communications.
- Database access within and without an organization.

Parts are here already. Wang's Image Transfer System offers network image store-and-forward. And many are the PC software offerings that combine word processing, graphics, spreadsheet analysis, and database management.

A Hewlett-Packard system transmits graphics on an electronic mail net. Texas Instruments sells a speech processing chip for audio message transmission and storage.

But successful multifunction systems must be compatible with large portions of today's installed base, which requires translating the codes and commands of hundreds of products. And, of course, a critical mass of installed multifunction devices will have to be achieved so their communications capabilities are useful.

TO DISTRIBUTE PROCESSING

"A distributed processing network provides a great deal of system reliability," explains Samuel Gagliano, vice president of product marketing at Wang Laboratories, Inc., "because a disturbance or downtime associated with any single node does not prove fatal to the entire system. It also allows users to reduce communication costs by taking advantage of economical local telephone connections and batch delivery of messages during off-peak hours."

By 1989, there will be some 46 million personal computers, word processors, and small-scale computers at work in American businesses—plus another 30 million computer terminals. Over 35 million of these devices will be personal computers.

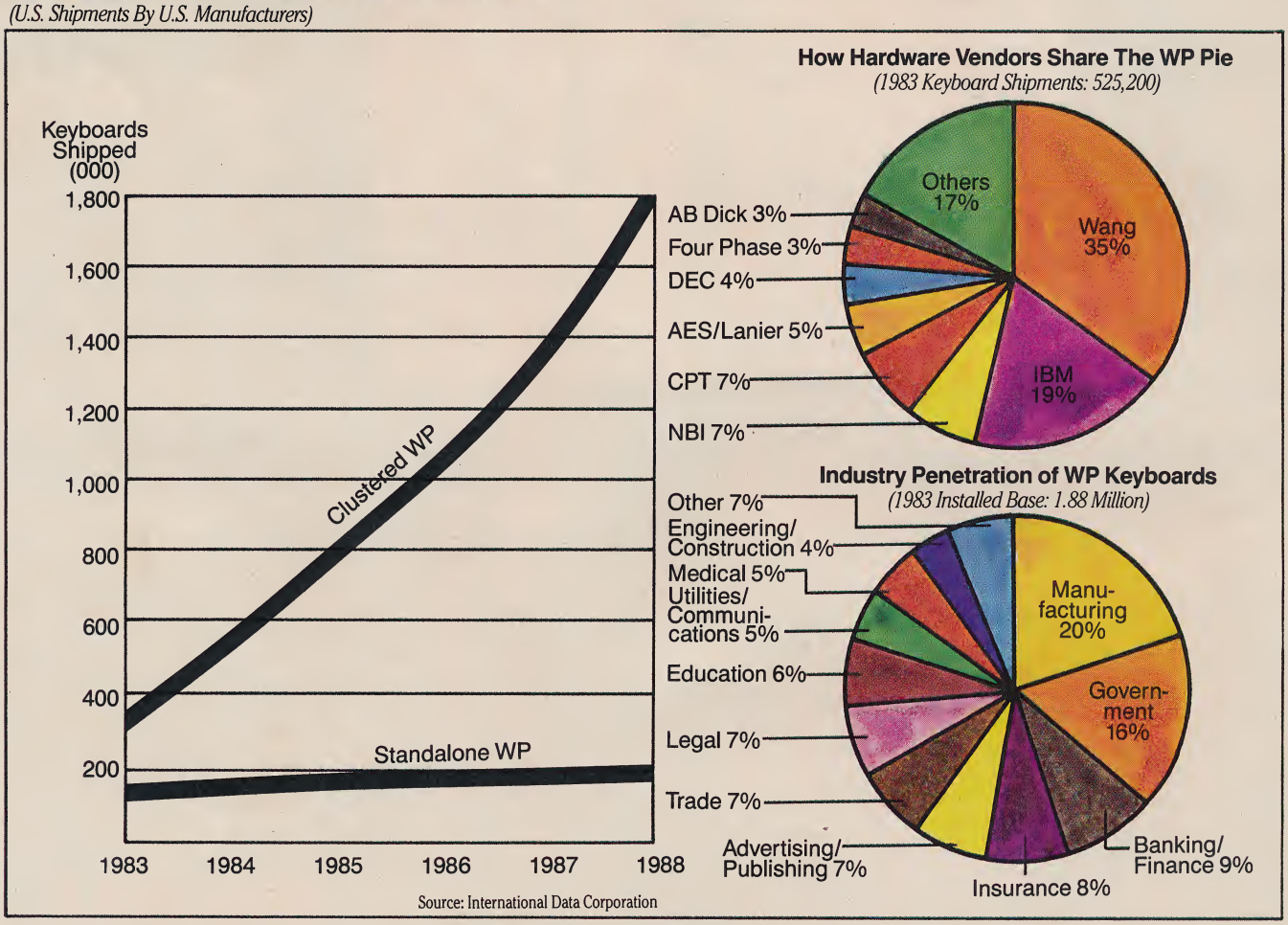
Even now, this enormous bulk of computing capability is forming a critical mass that demands sophisticated, easy-to-operate data communications facilities.

PC Networks

Computers themselves are very quickly being distributed to all

NO MOMENTUM LOST IN WORD PROCESSING

(U.S. Shipments By U.S. Manufacturers)



When the word processing market was launched in the late 1970s, these devices were touted for their unparalleled ability to automate typewriter functions and vendors mostly sold standalone models.

But times have changed. Now it's clustered systems that are popular—those with a central controller handling several terminals—and vendors are responding to user demands for integrated products that take on such additional tasks as spreadsheet modeling, graphics, and intermachine communications.

DISTRIBUTED PROCESSING

THE RACE FOR THE DESKTOP

manner of individuals for a vast multitude of purposes. As these individuals adapt to their new tools, the need will be overwhelming for interconnecting networks that bring independent computers into a unified whole—for the simple fact is that individual purposes must interact and feed on each other if they are to serve an organization.

PC networking is thrusting in two directions:

- Peer-to-peer dialog via PCs looped together, with or without larger computers that handle network switching.
- Micro-to-mainframe or mini communications via linking PCs to large computers in order to access their greater power and wealth of data.

Micro-to-mainframe linkage is, according to IDC surveys of large corporations, far more important than the PC-to-PC nets. Fully 41% of the firms interviewed by IDC indicated that at least half their installed personal computers have mainframe access.

But far fewer have employed small PC nets; 76% said that less than 5% of their PCs were linked via small peer-to-peer networks.

This preference for large-scale networks rather than smaller peer nets signals that major corporations are leading the way in building complete, company-wide information systems of which PCs are an integral part.

But even big firms fight a tide that's flowed the other way for a long time. "Businesses of all sizes have been put in a position of having to build several networks within their facilities," observes John Cunningham, Wang's president and CEO.

"This has happened," he says, "because telephone systems have been separate from computer systems and computer systems from one vendor have been incompatible with those of another vendor. What's required today is a single network that allows telephone and computer equipment to transport information with equal ease."

Since the telephone plant is designed for the human voice instead of computer-generated data, there are many products and services designed to assist digital signals in traveling analog lines.

Black Boxes

These are hardware devices that reformulate data into something the phone system can handle. U.S. data communications equipment suppliers' revenues will reach almost $3 billion by yearend 1984 for the products they ship worldwide.

Modems perform *mo*dulation and *demo*dulation of digital signals into analog ones that can be moved over telephone lines. They also check for errors, perform diagnostics, and provide autodialing. Modems represent nearly half of data communications equipment sales, according to IDC market estimates.

In the 1980s, modem suppliers like Hayes Microcomputer Products have developed offerings for minicomputers and personal computers.

Network Control and Management Systems expand modem capabilities to include the sophisticated diagnostics and central-control-based test and monitoring functions so critical as one or two modems grow into a network. Still an embryonic market, network control and management systems sold by Codex, Milgo, Paradyne, and others will claim just $195 million in 1984 revenues.

Multiplexers collect signals from a number of machines before sending the signals over phone lines, since several slow-speed devices sharing a single high-speed line adds up to savings. More advanced multiplexers also assume that not all devices communi-

WATCHING MONEY THE AUTOMATED WAY

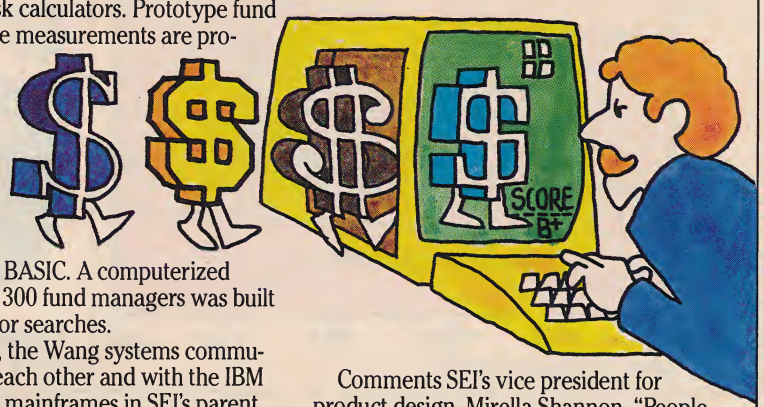
Consultants, no matter the type, are in the business of information—usually customized information. And generating information unique to each customer is costly, since such work is often done by high-paid professionals.

So it's not surprising that most consulting firms are interested in boosting employee productivity. SEI Corp.'s Funds Evaluation Division—which provides performance evaluation and consulting services to corporate pension plan sponsors and institutional money managers—is no exception.

Back in 1980, SEI had a phalanx of client services representatives who were spending a lot of time manually customizing textual, graphic, and tabular information for some 1,500 clients. The need to improve their productivity had become acute.

So after conducting an automation research study, SEI installed several multi-user Wang Office Information Systems (OIS) in Chicago, New York, San Francisco, Los Angeles, Atlanta, and Toronto; Boston and Philadelphia got Wangwriters.

The systems handle more than word processing. They're used to calculate internal and time-weighted rates formerly done on desk calculators. Prototype fund performance measurements are programmed in BASIC. A computerized database on 300 fund managers was built and is used for searches.



Moreover, the Wang systems communicate with each other and with the IBM and Amdahl mainframes in SEI's parent company.

Results are impressive: SEI now sends quarterly seven-page letters to clients with summaries of fund performances, and automatic generation of quarterly analysis of individual fund performance data has saved client services reps having to prepare additional customized reports.

Comments SEI's vice president for product design, Mirella Shannon, "People who have never seen a computer before increased productivity and produced higher quality reports and presentations."

DISTRIBUTED PROCESSING

THE RACE FOR THE DESKTOP

cate at the same time, so they cut down the number of output lines.

Multiplexers constitute nearly 25% of 1984 data communications equipment shipments. Vendors include General Datacomm, Timeplex.

Network Processors switch signals once they're in the network. Concentrators use sophisticated software routines to compress data so more devices can share a single line. Other processors manage incoming calls for computer systems. These products account for over a third of U.S. data communications suppliers' shipment dollars.

Software That Communicates

Sales of software packages that perform data communications functions will bring independent software companies $100 million in 1984 revenues. Add hardware manufacturers' datacomm revenues to that and the figure more than doubles.

IDC research shows that data communications software is one of the fastest growing sectors in the software industry—by 1988, independents will see revenues of nearly $600 million.

These software offerings have mostly been designed for larger mainframe and medium-scale computer systems. Access method software performs data transfer between the processor and its peripherals. Teleprocessing software handles simple data entry tasks or a single remote terminal. Timesharing software permits many users equal access to a single computer. Teleprocessing monitors deliver a complete support environment for many different but interacting users of a single computer.

This type of software pre-dates personal computers, however, and cannot handle communications between PCs and mainframes. Since demand these days is mostly for PC-to-PC or PC-to-host communications, a couple of different approaches have emerged:

• *Terminal emulation software* disguises the PC as a terminal that the mainframe already knows how to communicate with.

Several types of terminal emulators are offered by hundreds of vendors. Many are very slow and cannot format data from the mainframe. Some include full-screen editing but still require the user to understand the structure and syntax of the mainframe database, and to know how to log-on, request a file, etc. Vendors include Hayes Microcomputer, Microstuf.

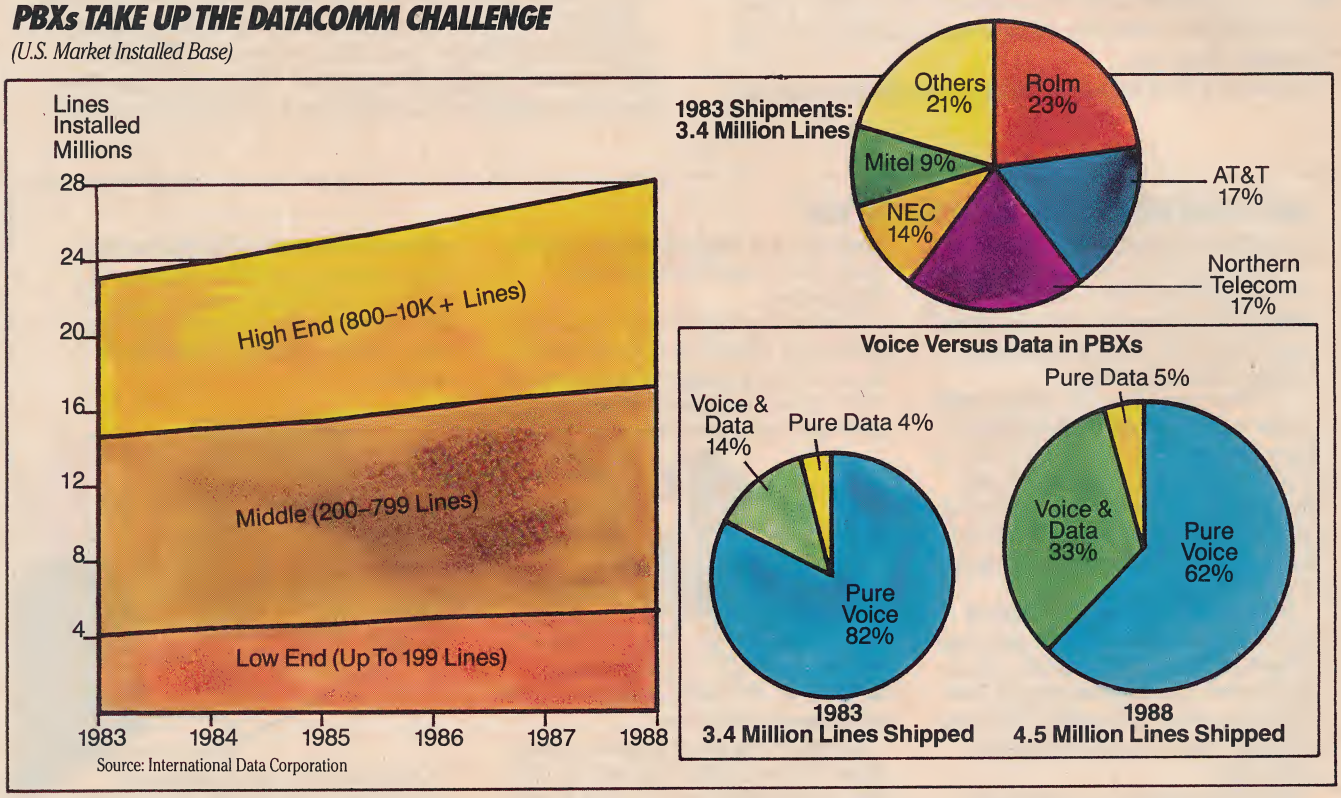
1984 terminal emulation software sales will top $20 million, says market research consultant Susan E. Messenheimer; by 1988, she predicts, sales will hit $80 million.

• *Micro-mainframe links* translate mainframe file structures into PC file structures. Some use a friendly query language so that particular files—even fields and records—can be specified for downloading.

"The fundamental problem in connecting micros to mainframes or minis has been incompatible software on the different-sized machines," says Larry Ellison, president of Oracle Corp.

PBXs TAKE UP THE DATACOMM CHALLENGE

(U.S. Market Installed Base)



Deregulation of the nation's communications industry has triggered new growth and much change in the once staid PBX market. Low-priced, easy-to-install systems geared for small businesses are pumping up the low end, while high end expansion is coming from the migration of Centrex users to cheaper PBX alternatives.

It all adds up to new opportunities for PBX suppliers, since AT&T no longer has a monopoly-based stranglehold on the market; indeed, AT&T's share of PBX shipments has slipped from 52% in 1980 to only 17% in 1983. And the PBX market leader now is Rolm, which was recently acquired by none other than IBM.

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THE RACE FOR THE DESKTOP

"To effectively link computers into a network, all machines—micros, minis, and mainframes—should run the same database and application development software," Ellison notes. "Standard software provides a standard interface between users and their machines, and between the machines and the network. Only then can data and programs be easily shared among the different machines."

Most vendors of micro-to-mainframe links claim origins in the mainframe side of the software industry. Generally, their links are designed only for their own mainframe software and the more popular microsoftware offerings, such as VisiCalc and Lotus 1-2-3.

Some are attempting to develop a more universal link—a way to easily move mainframe data to micros and vice versa, across software product lines—which won't be easy given the wide variety of file structures in use.

Such prospects have not served to dampen this market, however. A new link seems to be announced daily and the list of vendors is already long, including Computer Corp. of America, Cullinet Software, MSA, Mathematica Products Group, McCormack & Dodge, Applied Data Research, and Informatics General.

Micro-mainframe link vendors will bring in $10 million in 1984, thinks Messenheimer, and 1988 revenues will approach $700 million.

PBXs

The machines that years ago took over the chores of telephone operators—and have since evolved into switches that are highly sophisticated in handling voice traffic—are now taking on data communications, too.

Some argue that PBXs will become the communications gateway to and from the office, linking voice and data networks with a multitude of local loop and long haul transmission services.

It's a sturdy argument: advanced, fourth generation PBX systems, which boast distributed architecture and digital-based circuit- and packet-switching functions, even include integrated local area network capabilities. There are a sizable number of vendors with such PBX products, too, including CXC, InteCom, NEC, Northern Telecom, Rolm, Ztel.

The PBX market used to be considered mature and slow-growing, but the breakup of AT&T has created new market opportunities for PBX vendors:

- The old Bell Operating Companies, now called Regional Holding Companies, are signing marketing agreements with vendors other than AT&T, so there's been a dramatic fall in AT&T's share of PBX shipments—from 52% in 1980 to only 17% in 1983.
- As part of the divestiture of AT&T, the FCC will impose local access charges on all lines entering a local operating company's central office switch. Each of those lines will be charged a monthly access fee, which favors PBX users over Centrex users: PBX systems bundle up to 15 individual phone lines into one direct access line that feeds into the central switch, but Centrex users' phones each have direct line access to central switches.

For PBX vendors, though, the next few years portend shakeout as competitive steam builds, and those PBX markets that'll see the most growth also hold the most danger:

- Low-end PBXs (like those sold by Mitel, Hitachi, and others) are becoming standardized and will soon be a commodity product where lower prices will pinch profit margins.
- High-end PBXs (such as products from NEC, Siemens, TIE) will have to include sophisticated integrated voice/data capabilities to meet users' demands, so those vendors who haven't developed a full line of products and services will likely be edged out.

Local Area Networks

Any outfit with more than a few computing devices will be attracted to the virtues of a local area network—a single backbone that flexibly links resource stations, independent of size and type, in a limited geographic area (campus, building, or work area).

LANs come in two types:

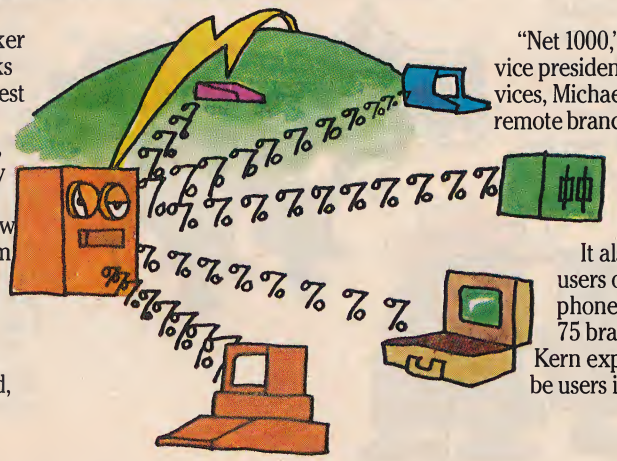
- Baseband LANs use either twisted pair or coaxial cable. Geared mostly to office work areas, baseband LANs are limited in speed and in the number of devices they support—but they're an effective short-term solution to networking needs, and represent the bulk of LAN installations. Among the many baseband LAN vendors are Apollo, Corvus, Datapoint, Gould, Nestar, Xerox.

BATTING A THOUSAND IN MORTGAGE INFORMATION

In banking, time is money. So the quicker branch offices and other affiliated banks get information about the likes of interest rates, the better.

But Minneapolis' Norwest Mortgage, Inc., second largest mortgage company in the nation servicing $13 billion in loans, needed a system that would allow access to its mortgage information from a wide variety of personal computers, minicomputers, mainframes, and modems.

The answer was AT&T Information Systems' Net 1000, a shared, distributed, intelligent network.



"Net 1000," says Norwest's assistant vice president of communications services, Michael Kern, "allows us to bring a remote branch up to corporate technological speed literally overnight without major capital expenditures, personnel moves, or a lengthy training cycle."

It also allows Norwest to take users off more expensive leased phone lines. Some 40 of Norwest's 75 branches use Net 1000, and Kern expects 500 affiliated banks to be users in a year or two.

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THE RACE FOR THE DESKTOP

• Broadband LANs are usually bigger than baseband as well as pricier and more complex. An entire facility is typically networked by a broadband LAN, often in industrial/manufacturing environments since they feature greater traffic capacity and are more ruggedized. Because of their cost and a lack of industry-wide broadband standards, fewer than 2,000 broadband LANs will be operating in the U.S. by yearend.

Even though the market for LANs has been limited by a couple of factors—installation is expensive because buildings must be wired and vendors cannot agree to LAN standards—local area network technology offers a powerful solution to the mushrooming problem of organizational data communications.

LANs allow users to share such resources as printers, disk drives, database management systems. LANs can act as a common interface between incompatible equipment, including telephones, since LANs can carry voice communications. Such critical capabilities as network management, error reporting, diagnostics, and fault isolation are all built into LANs, so they can be centralized.

Voice/Data Integration

Even though local area networks and fourth generation PBXs are capable of transmitting both voice and data, very little equipment today really integrates them.

There are problems: LANs that handle voice or PBXs dealing in data are hybrid creatures, and they face design tradeoffs. One digitized voice channel, for example, equals roughly 40 data terminal channels—which makes digitized voice expensive.

But predecessors of voice/data integration are here:

• Voice/data terminals combine computer terminal or personal computer and telephone (suppliers include Northern Telecom, Davox).

• Voice mail systems store verbal messages in computers for later retrieval (offered by Wang, Four-Phase, Sperry).

• Teleconferencing systems integrate voice, video, and data, but are further off—though several vendors, including IBM, are at work.

• Developments in speech synthesis and voice recognition continue in both commercial and academic research facilities, and have gotten a boost from growing interest in artificial intelligence.

The challenge to users—and it is profound—is to pick and choose from all these automation alternatives so that the resulting technological amalgam seamlessly serves the organization and its individuals without sacrificing their integrity or their efficiency.

Text for DISTRIBUTED PROCESSING: THE RACE FOR THE DESKTOP was prepared by International Data Corporation (IDC), Framingham, MA. Coordinated for IDC by Joseph Levy, managed by John Gantz. Text: Carol Weiszmann. Administration: Diane Testa. Graphics: Gael Burns.

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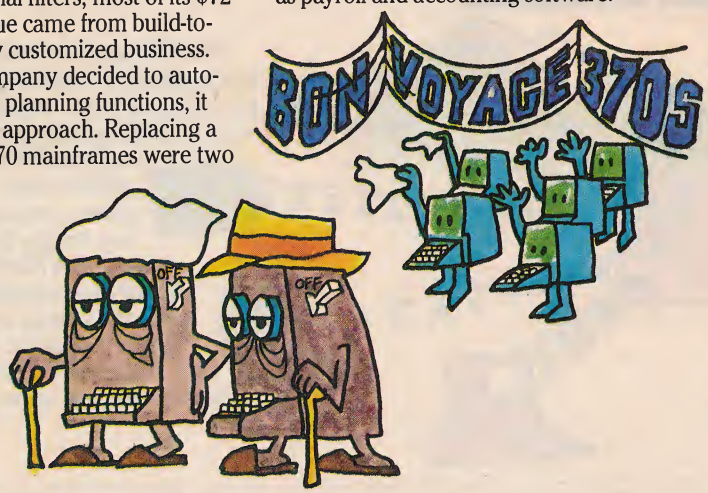
COMPUTING SOLUTIONS: MICROS TO MAINFRAMES—December 9, 1985. Ads close November 11, 1985.

WHAT DECENTRALIZATION CAN DO

There's an old adage that says automation must fit corporate style if it's going to work.

At Eimco (Salt Lake City), an international manufacturer of waste treatment gear and industrial filters, most of its $72 million in revenue came from build-to-order and highly customized business.

When the company decided to automate some of its planning functions, it took an unusual approach. Replacing a couple of IBM 370 mainframes were two MDS Qantel minicomputers linked to each other and a fleet of IBM Personal Computers via a Qantel Best Net. The machines run Qantel's QMRP material requirements planning software as well as payroll and accounting software.



One mini is in the hands of the materials manager; the other is under the control of the financial manager. The data processing manager, who once ran a department of 20, now operates as a department of one roving the company to provide systems advice.

PCs are located in each department. Bill Dunn, who spearheaded Eimco's move to DP decentralization, notes that "A layer of bureaucratic structure has been eliminated, interdepartmental friction has been eased, and so have processing delays."

The savings are notable, too. Payback on the Qantel system came in less than a year, costs have dropped $500,000 a year, and inventory has been reduced by 25%.

For the right company, the virtues of decentralization can be substantial indeed.

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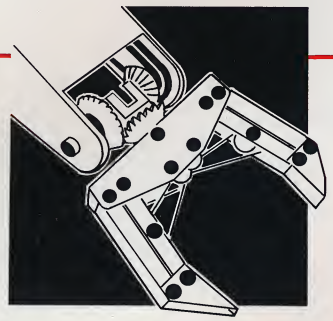

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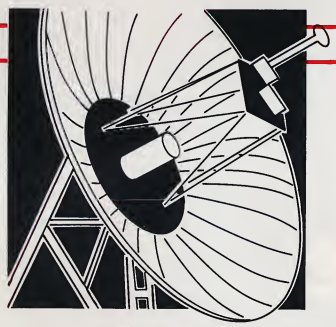

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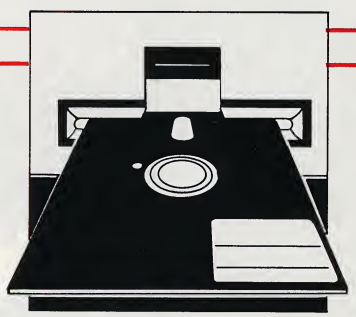

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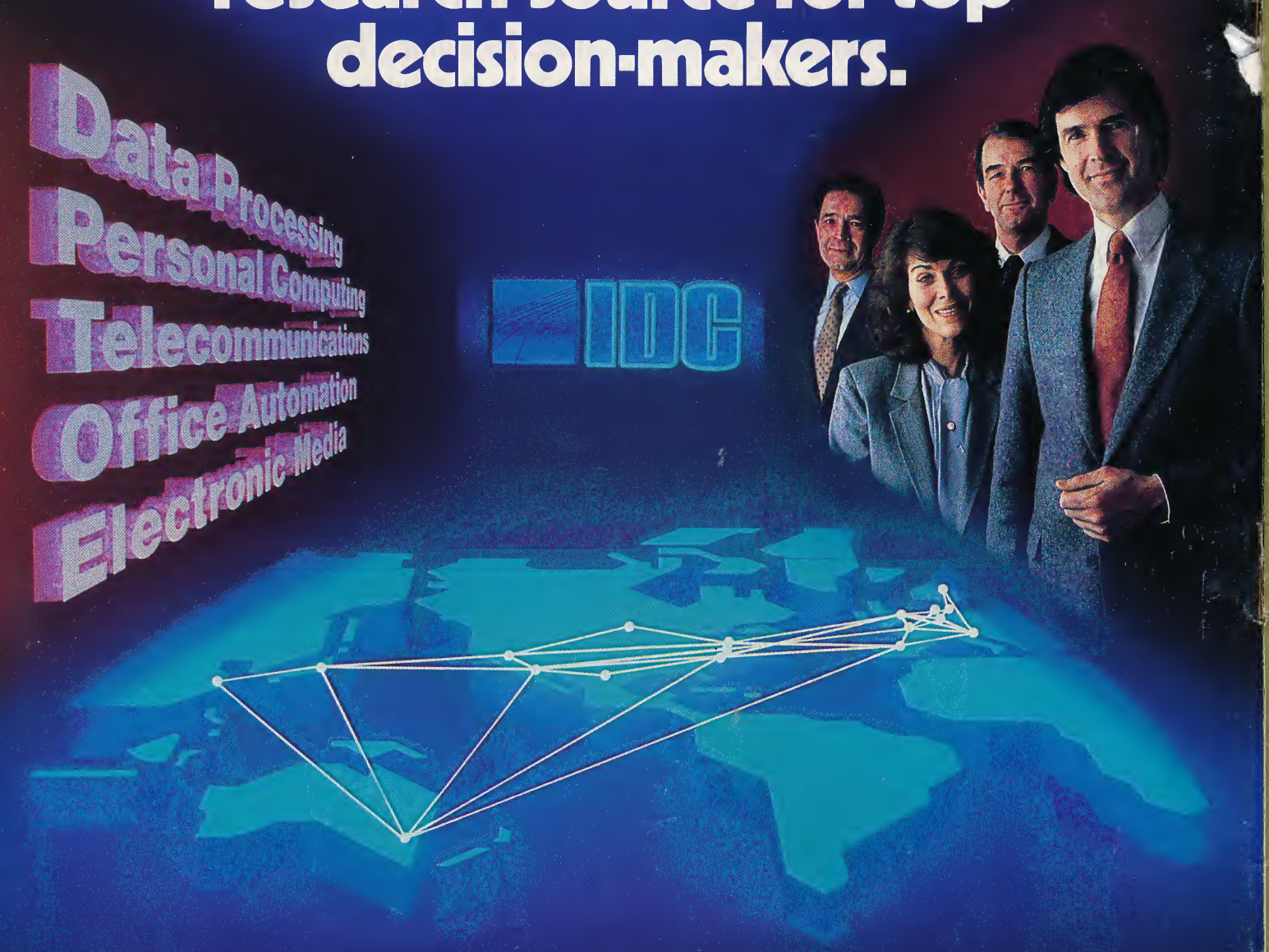

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